INLINE COUNTER ROTATING UNSCREW MOLD MECHANISM

FIELD OF INVENTION

The present invention relates to the field of unscrewing mechanism within the mold to facilitate ease of ejecting threaded molded parts in a typical injection molding process.

BACKGROUND OF THE INVENTION

The use of certain mechanism, specifically unscrewing mechanism to facilitate ease of ejecting threaded molded parts in a typical injection molding process has been around for quite some time. Conventional unscrewing mechanism typically have a much bigger and complex footprint, with the possibility to be inter-changeable depending on the product part that needs to be molded out. Conventional unscrewing mechanism for unscrewing molds are typically hydraulically driven, and the number and size of the threads on the part dictate the number of revolutions the core must rotate before the mold can open. The number of rotations necessary then determines the length of the hydraulic rack and the size of the hydraulic cylinder, hence the possibility of having a bigger footprint for the unscrewing mechanism, thus affecting the size of the mold base.

Hence for example, if a part that has so many threads such that the hydraulic rack (which is mounted to the mold) has to be unrealistically long in order to unscrew the part from the core, that means the footprint occupied by the unscrewing mechanism will definitely be big. This is important as the mold needs to be fitted into certain size of the injection molding press. Known methods for making molded threaded articles include patents US 5,061,168 (by Alton Fox), US 5,776,521 (by Wright etc.) and US 6,390,800 (by David R. Brown and Henry J. Rozema). Most of the prior art mentioned earlier have

complex designs cum mechanisms and also potential of bigger footprints on the mold base for parts with more threads.

The mechanism disclosed in the present invention has a smaller footprint mechanism as compared to conventional mechanism with the same function. The disclosed mechanism in the present invention is used for opposing taper thread joints, and is to simplify the current mechanisms used for part release by utilising a gear train inside a multi-cavity high yield mold. It eliminates the need for a separate mechanism for similar threaded parts, thus reducing the complexity in the injection molding process for such threaded parts.

The present invention discloses an inline counter rotating part release mechanism that consists of the following main components for it to work effectively:

(a) Main transmission drive shaft;

(b) Fixed planetary gears, i.e., at least minimum three (3) sets;

(c) Inline annular sleeve;

(d) Inline secondary drive; and

(e) Rotating breakaway slide insert

For the present invention, for the purposes of describing the operation, the main transmission drive shaft rotates in an anti-clockwise direction. This rotating motion induces a clockwise action on the three (3) fixed planetary gears, causing it to rotate in a clockwise manner. The inline annular sleeve will then start to turn clockwise following the fixed planetary gears motion. The rotating motion of the main transmission drive shaft will also turn the inline secondary drive shaft, which in turn rotates the rotating breakaway insert in an anti-clockwise motion. As the rotating breakaway insert starts to

rotate anti-clockwise, it will cause the injection molded part to unfasten, while at the same time it pushes linearly against the rotating breakaway insert, thus releasing the injection molded part. Similarly, for the purposes of describing the operation, if the main transmission drive shaft rotates in a clockwise direction, the rest of the steps/sequence as per described earlier on in this paragraph shall then be in the opposite direction.

For the present invention, it can have the following advantages:

1. Ability to form full threads in injection molding part with opposite converging far ends tapers.
2. Ability to form Diameter M3.00 full internal thread and larger without the use of collapsible inserts.
3. The mechanism uses single planetary gear transmission as opposed to two separate mechanism that can be commonly found in the existing prior art, thus minimizing the cost and reduction of material.
4. Smaller footprint in the mold base will indirectly contribute to lower mold cost as compared to existing prior art performing the same function using a different unscrewing mold mechanism / design.
5. Quick release of plastic molded part due to the inline mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings attached here are to aid comprehension of the description of the invention here. The drawings are not to scale and they are to be used for merely illustrating the principles and concepts of the invention only.

To aid in comprehension of the invention, the drawings are separated into the various Figures as described below:

Figure 1 illustrates an exploded view of the various key components and functions related to the embodiment of the present invention.

Figure 2 illustrates the cross-sectional view of the mechanism motion for items denoted as **2, 3** and **4** based on the embodiment of the present invention.

Figure 3 illustrates an overall perspective view of the mechanism when the mold is closed and no injection is taking place (Stage 1).

Figure 4 illustrates an overall perspective view of the mechanism during part injection (Stage 2).

Figure 5 illustrates an overall perspective view of the mechanism when the molded part is ejected from the mold (Stage 3 and 4).

Note: All the illustrations in **Figure 1 to 5** excludes the rest of the mold design components.

Reference numbers

1	Inline Counter Rotating Part Release Mechanism
2	Main Transmission Drive Shaft
3	Fixed Planetary Gears (x3)
4	Inline Annular Sleeve
5	Inline Secondary Drive
6	Rotating Breakaway Slide Insert
7	Locking Flange
8	Sliding Flange
9	Molded Part

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT OF THE PRESENT INVENTION

In the following description, details are provided to describe the embodiment of the application. It shall be apparent to the person skilled in the art, however, that the embodiments may be practiced without such details.

The present invention relates to the field of unscrewing mechanism within the mold to facilitate ease of ejecting threaded molded parts in a typical injection molding process.

Figure 1 illustrates an exploded view of the various key components and functions related to the embodiment of the present invention. **Figure 1** illustrates the inline counter rotating part release mechanism denoted as **1**, which comprises of the key components, namely, main transmission drive shaft denoted as **2**, at least three (3) fixed planetary gears denoted as **3**, inline annular sleeve **4**, inline secondary drive **5** and rotating breakaway slide insert **6**. The ancillary components, i.e., the locking flange denoted as **7** and sliding flange denoted as **8** aids in the positioning and alignment of the entire inline counter rotating part release mechanism **1** when it is incorporated within the mold base in a typical injection molding process.

Figure 2 illustrates the cross-sectional view of the mechanism motion for items denoted as **2, 3** and **4** based on the embodiment of the present invention. **Figure 3** to **Figure 5** illustrates an overall perspective view of the embodiment of the present invention at different stages of operation. Take note that all the illustrations in all the **Figures** exclude mold design components. **Figure 3** illustrates how the embodiment of the present invention shall be when the mold is at the closed position without any injection taking place, i.e., Stage 1. During injection Stage 2, the molten plastic or polymer will

then be shot inside a mold base via various cavities (depending on the design of the mold) through the gating highlighted in **Figure 3**. **Figure 4** illustrates how the embodiment of the present invention shall be during the part injection Stage 2. This is then followed by the cooling process (Stage 3) whereby the molten plastic or polymer shall then be cooled to form the plastic part, followed by part ejection (Stage 4) as illustrated in **Figure 5**.

The ejection of the molded part **9** (illustrated in **Figure 5**) is facilitated by the inline counter rotating part release mechanism denoted as **1** in **Figure 1.** As illustrated in **Figure 2**, the main transmission drive shaft **2** rotates in an anti-clockwise direction. The rotating motion induces a clockwise action on the three (3) fixed planetary gears **3**, causing the three (3) planetary gears **3** to rotate in a clockwise manner. The inline annular sleeve **4** will then start turning clockwise following the fixed planetary gears motion. The rotating motion of the main transmission drive shaft **2** will also turn the inline secondary drive shaft **5,** which in turn rotates the rotating breakaway slide insert **6** in an anticlockwise direction**.** As the rotating breakaway slide insert **6** starts to rotate anti-clockwise, this rotating action will cause the injection molded part **9** to unfasten, and concurrently this rotating action from the unfastened injection molded part **9** pushes linearly against the rotating breakaway insert, thus releasing the molded part **9**.

Therefore, the present invention presented an innovative method of unscrewing mechanism within the mold to facilitate ease and quick speed of ejecting threaded molded parts in a typical injection molding process. The simplicity of this present invention contributes to a smaller footprint in the mold base, thus indirectly contribute to lower mold cost as compared to existing prior art performing the same function using different unscrewing mold mechanisms, most of the time at two (2) ends of the

unscrewing mold mechanism. Whereas this present invention combines two (2) into one (1) unscrewing mold mechanism.

While what has been described hereinabove is the preferred embodiment of the invention, those skilled in the art will understand that numerous modifications may be made without departing from the spirit and scope of the invention. The embodiments described herein are meant to be illustrative only and should not be taken as limiting the invention, which can be expressly set forth in the following claims.

CLAIMS

What is claimed is:

1. A **device** for ejecting threaded molded parts during injection molding, whereby it comprises of the following:
   (a) Main transmission drive shaft (denoted as **2** in **Figure 1**);
   (b) Fixed planetary gears, i.e., at least minimum three (3) sets (denoted as **3**);
   (c) Inline annular sleeve (denoted as **4** in **Figure 1**); and
      (i) whereby the main transmission drive shaft is in alignment with the fixed planetary gears which are housed or encased within the inline annular sleeve; and
   (d) Inline secondary drive (denoted as **5** in **Figure 1**); and
   (e) Rotating breakaway slide insert (denoted as **6** in **Figure 1**),
      (i) whereby the rotating breakaway slide insert is connected to the inline secondary drive on the other side of the annular sleeve.

2. A **method** of ejecting threaded molded parts during injection molding that comprises of the following:
   (a) Stage 1 where mold is closed with no injection taking place; followed by
   (b) Stage 2 where the molten plastic or polymer will then be shot inside a mold base via various cavities (depending on the design of the mold) through the gating; followed by
   (c) Stage 3 whereby molten plastic or polymer is then cooled inside the mold; followed by
   (d) Stage 4 whereby after part cooling, the main transmission drive shaft acts as a drive unit to drive the unit in one direction (either clockwise or anti-clockwise depending on settings) and

wherein with the fixed planetary gears moving opposite direction simultaneously, resulting in the breakaway slide insert to simultaneously rotate and slide out to unfasten the cavity thread features of the molded part, resulting in molded part quick release.